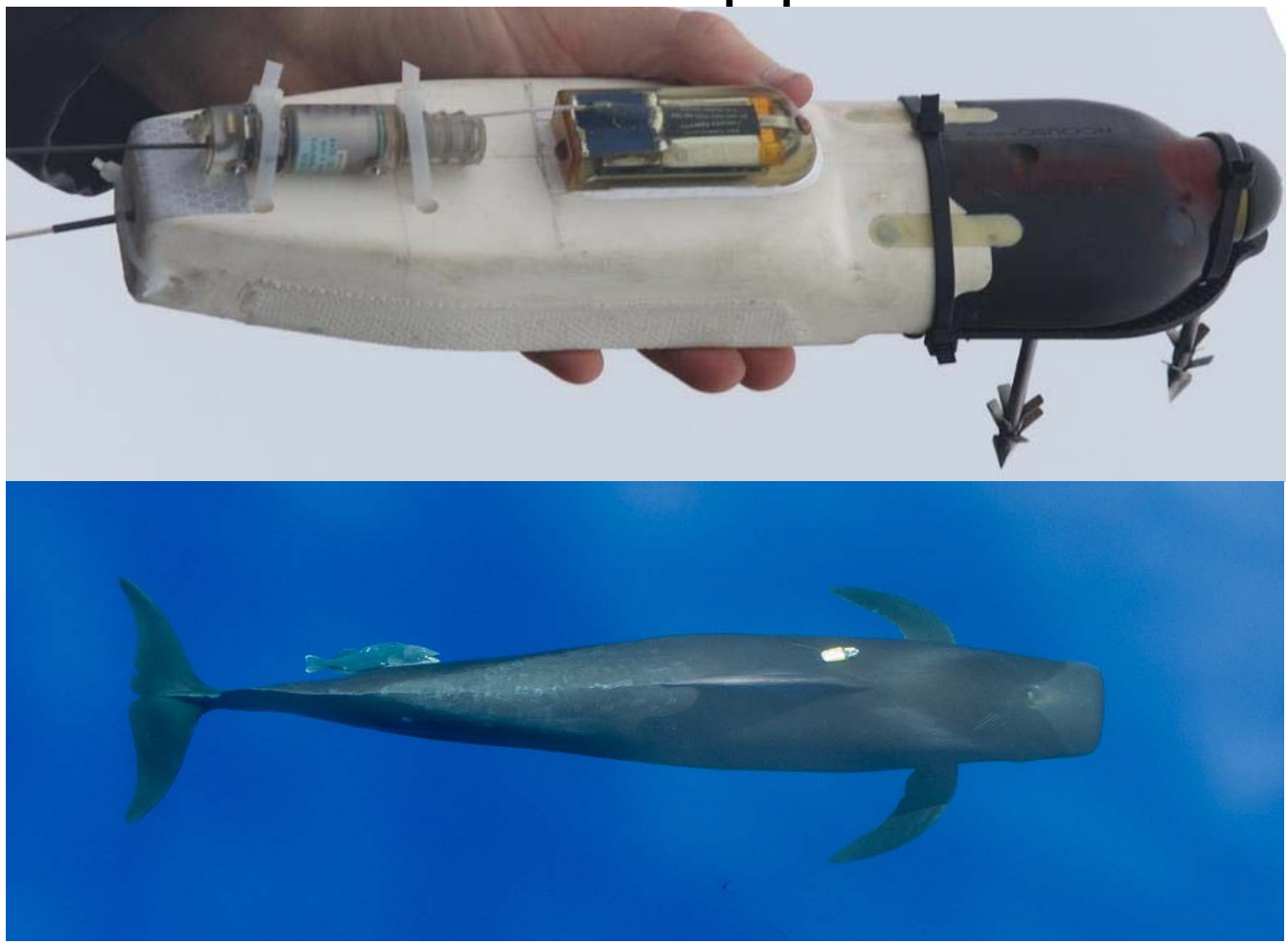
Recent advances in cetacean tagging methods and approaches



Robin W. Baird
Cascadia Research Collective
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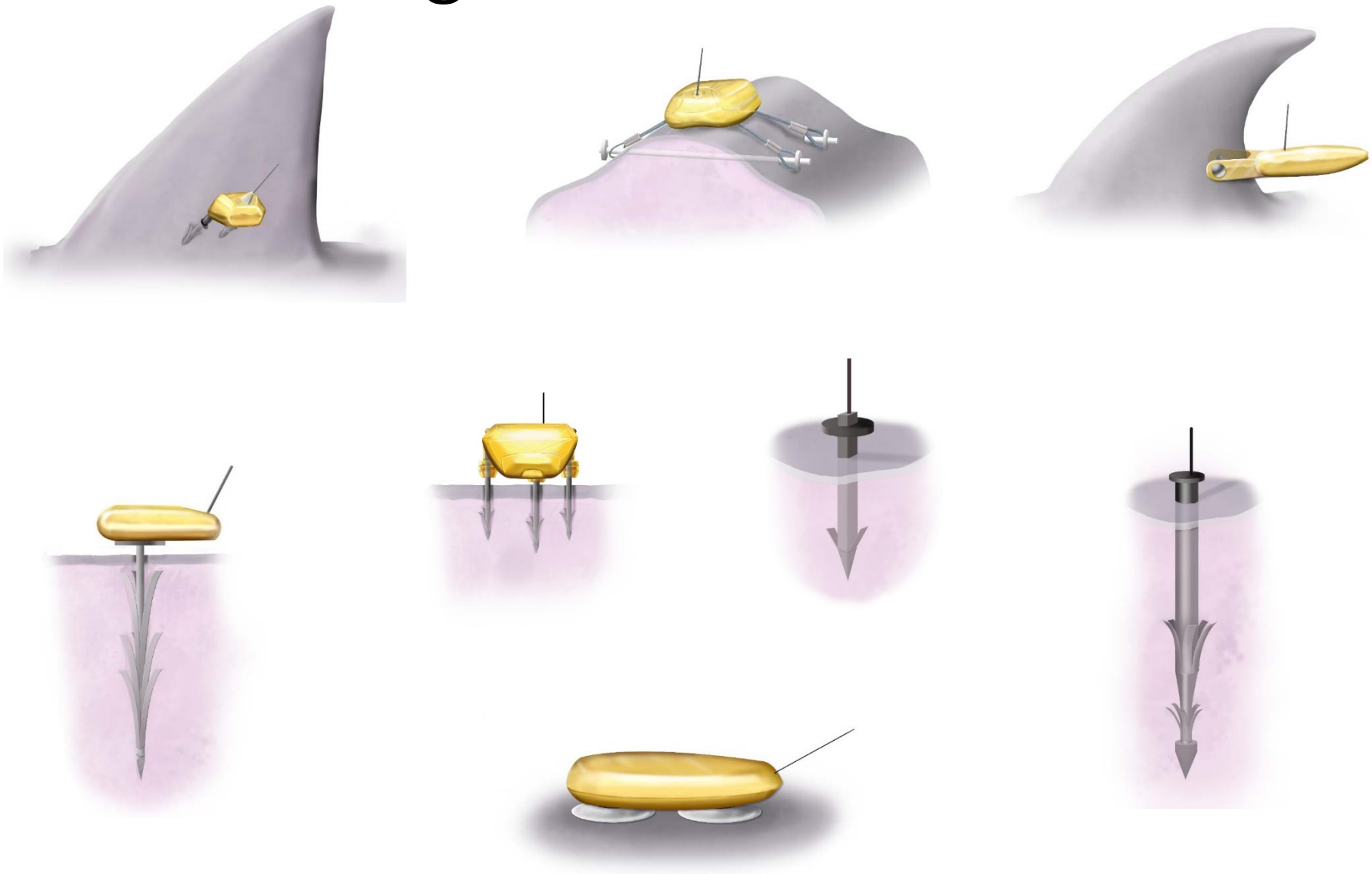
Presentation to the Marine Mammal Commission annual meeting, May 29, 2018

Tag data in relation to management needs

- **Responses of individuals to vessel noise** (e.g., Nowacek et al. 2003; Aguilar Soto et al. 2006; McKenna et al. 2015)
- **Call rates for interpreting data from acoustic surveys** (e.g., Oleson et al. 2007; Barlow et al. 2013)
- **Responses of individuals to mid-frequency active sonar** (e.g., DeRuiter et al. 2013; Falcone et al. 2017)
- **Overlap with fisheries and interactions with longline gear** (e.g., Stepanuk et al. accepted; Anderson et al. in prep.)
- **Population structure, range, and high density areas in relation to critical habitat** (e.g., Baird et al. 2010, 2012; Zerbini et al. 2015)

Radio* tag attachment methods



*other sensors often included (first time-depth recorder on pinnipeds – Kooyman 1966)

From Andrews et al. in preparation

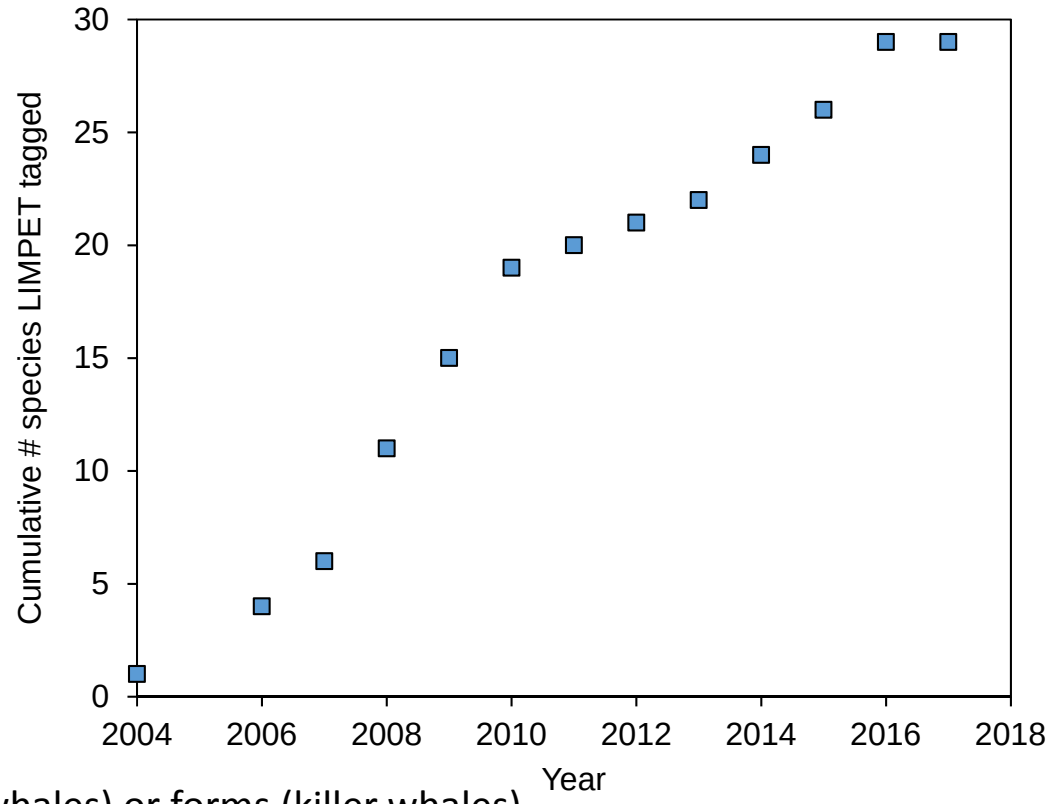
Radio* tag attachment methods

- Remote deployment of penetrating tags on large whales (1962/1965 – Schevill and Watkins 1966)
- Live captures (1968 – Evans, 1971), captured for tagging or upon release of live-stranded individuals
- Remote deployment of suction cup attached tags (1981 - Jeff Goodyear)
- Remote deployment on small cetaceans – dart-attached with tag electronics external (2004 – Russ Andrews/Wildlife Computers)

*other sensors often included (first time-depth recorder on pinnipeds – Kooyman 1966)

LIMPET: Low-Impact Minimally Percutaneous External-electronics Tags

- Not widely available until 2010
- Deployments on a wider range/broader number of species (3 families of mysticetes, 4 families of odontocetes, 29 species* as of 2017)



*not taking into account subspecies (minke whales) or forms (killer whales)

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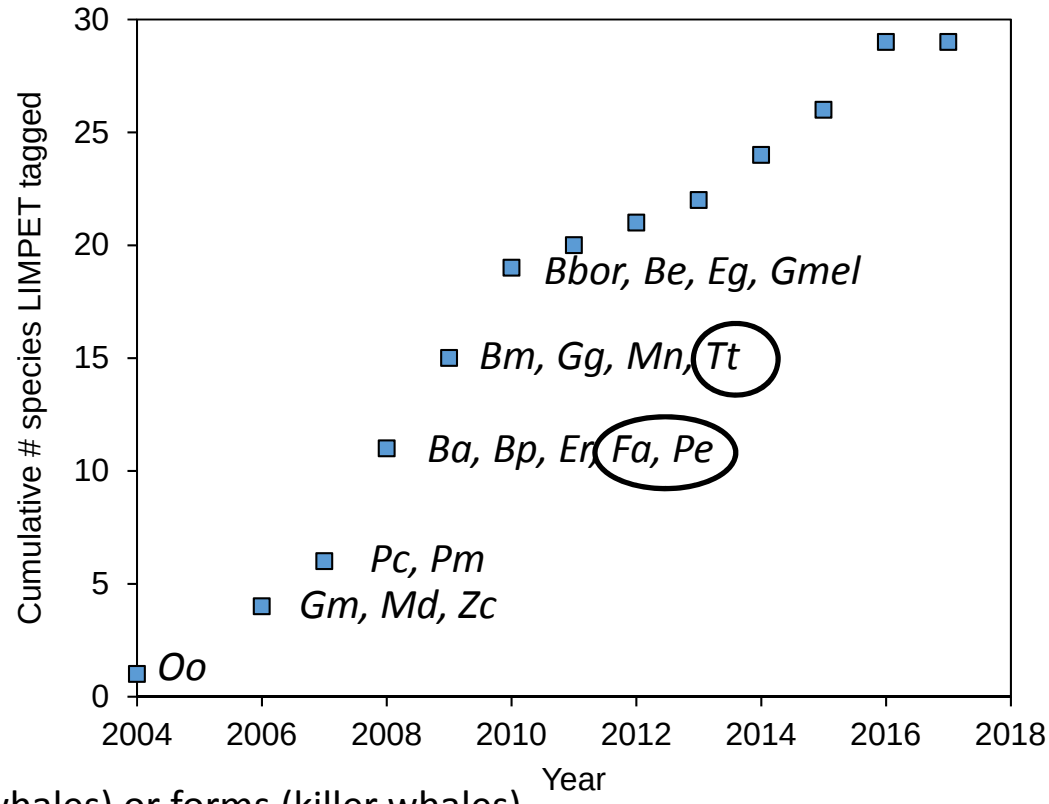

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LIMPET: Low-Impact Minimally Percutaneous External-electronics Tags

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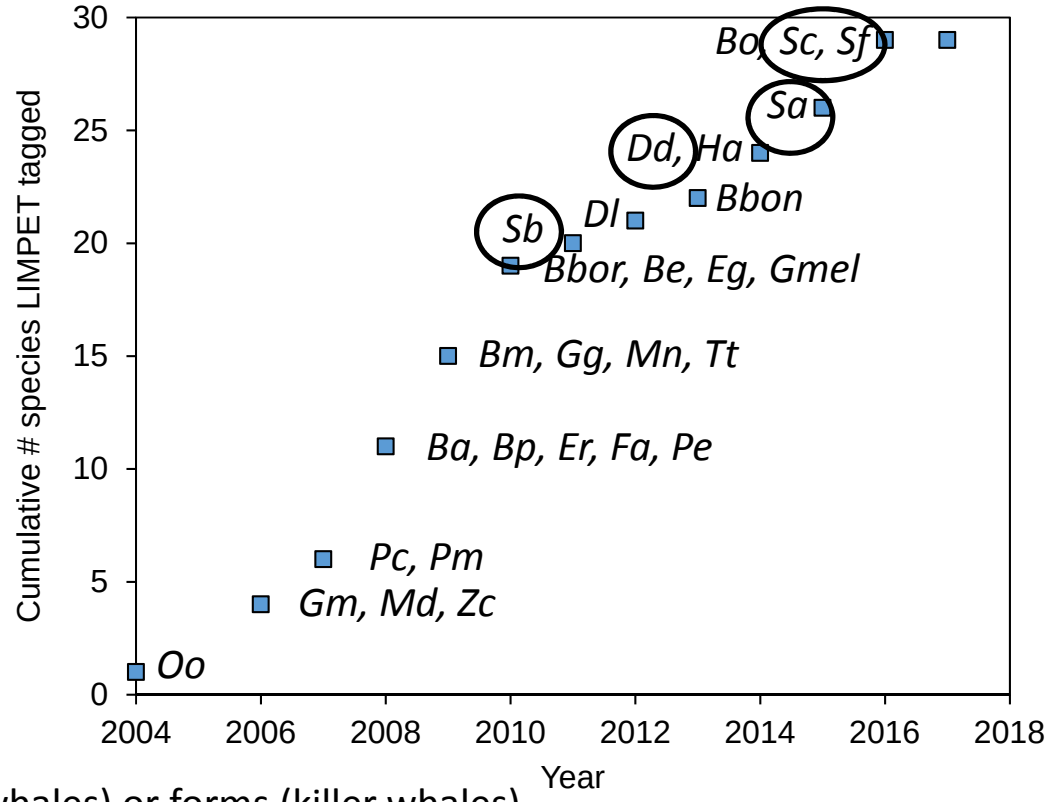
- Deployments on a wider range/broader number of species (3 families of mysticetes, 4 families of odontocetes, 29 species* as of 2017)
- Limited by size of target surface (e.g., dorsal fin) and blubber thickness in relation to dart length
- Limited by approachability of species
- Smaller species limited by expertise of tagger



*not taking into account subspecies (minke whales) or forms (killer whales)

Attachment duration varies by species

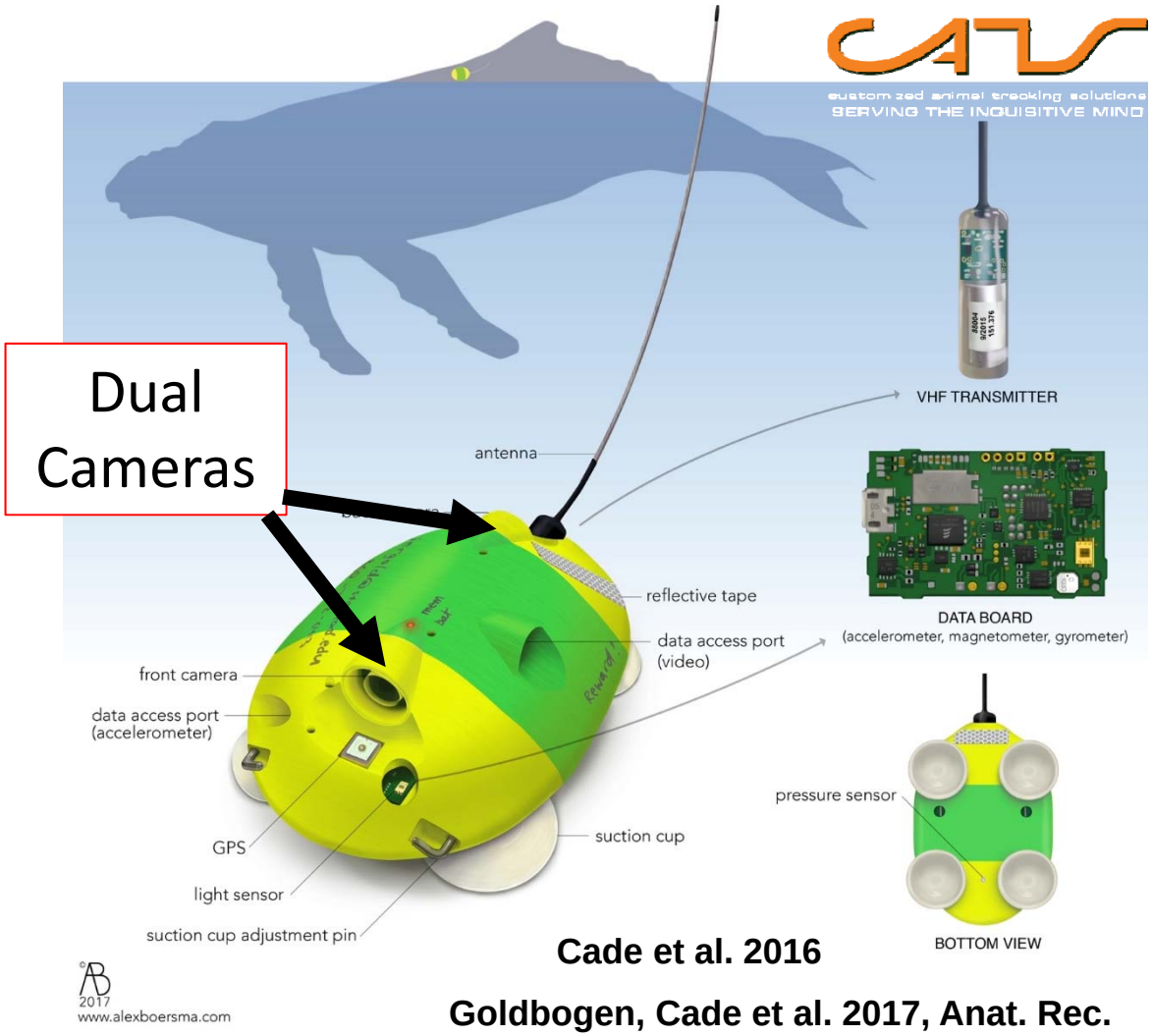
Combination of tagging with other types of data collection (photo-identification, laser photogrammetry, biopsy sampling for genetics/reproductive status, UAS for body condition)

Increased commercial availability and increased range of sensors

Multi-sensor video tags
CATS w/Stanford, UCSC, & Cascadia

Suction Cup VHF Tag:

- Depth
- Accelerometer
- Magnetometer
- GPS
- Hydrophone (19 kHz)
- Video (up to 9 hours)



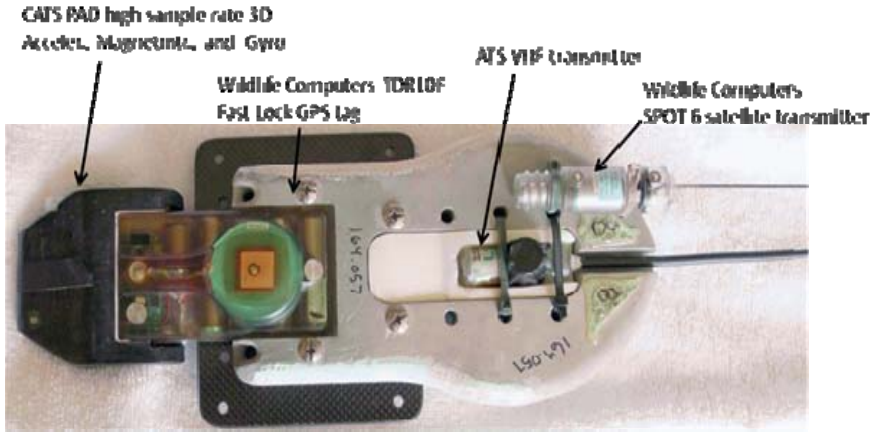
Dual Cameras

Cade et al. 2016

Goldbogen, Cade et al. 2017, Anat. Rec.

Custom dart-attached (medium-term) archival tags combining multiple transmitters and sensor packages

Surgical stainless darts designed after LIMPET titanium darts



Dart attached Acousonde with GPS and satellite SPOT6. Acoustic and GPS data for up to 3 weeks with high resolution multi-sensor data in current configuration.

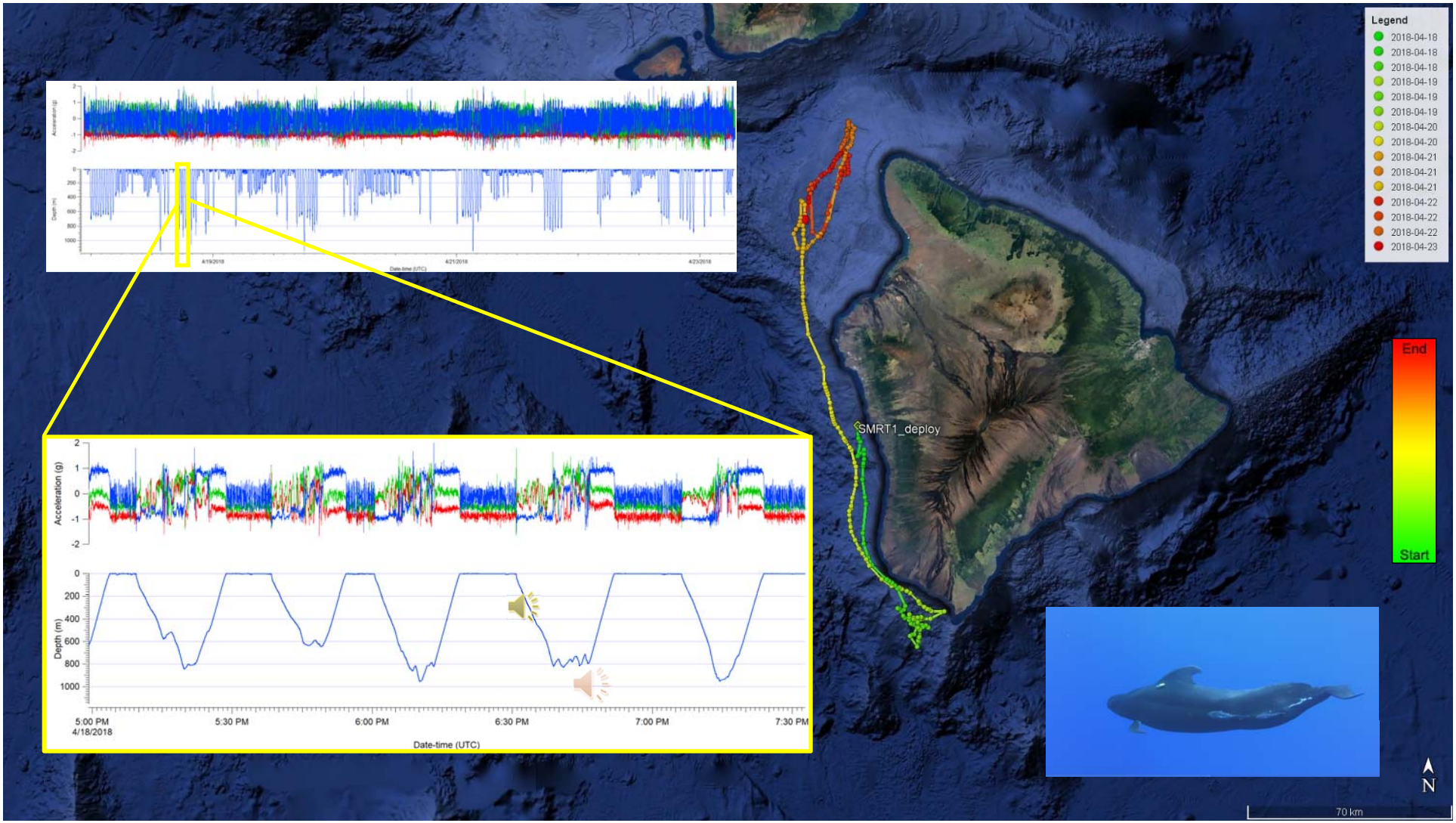
Szesciorka AR, Calambokidis J, Harvey JT. 2016. Testing tag attachments to increase the attachment duration of archival tags on baleen whales. Animal Biotelemetry.

Consolidated dart-attached medium-term archival tag with remote-release mechanism

Sound and Motion Recording Tag (SMRT)

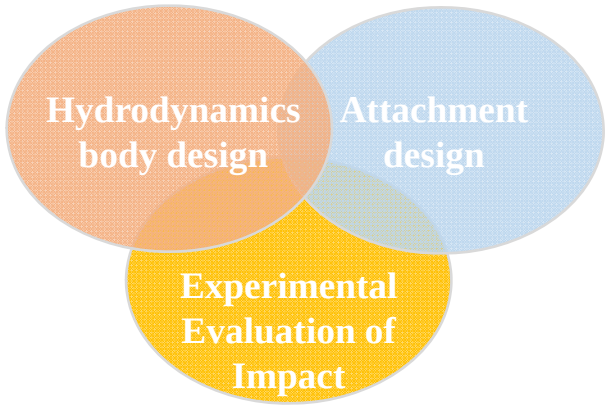
- Argos transmitter
- Fastloc GPS receiver
- Transceiver for 2-way communications
- Remote-release mechanism (timed or triggered)
- Depth
- Temperature
- Accelerometer
- Magnetometer
- Hydrophone (190 kHz, up to 14 days)

Sound and Motion Recording Tag (SMRT)

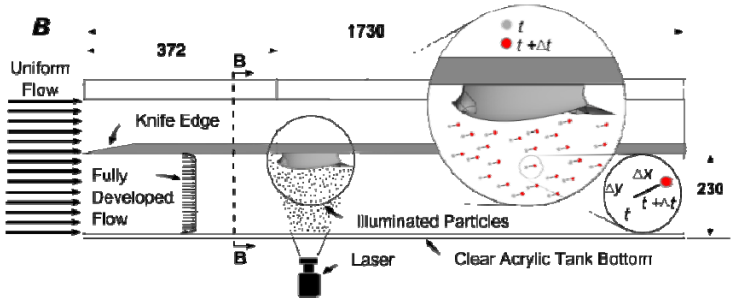


Source: Andrews, Johnson, Holland

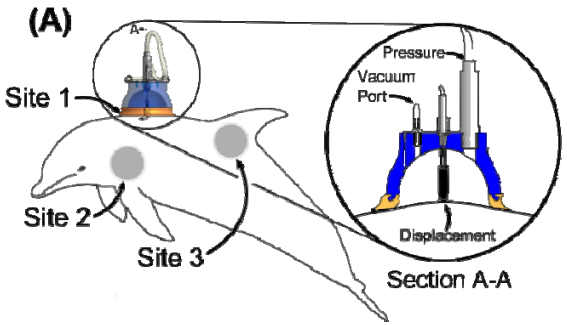
Ongoing efforts to improve tag design for suction-cup, LIMPET and deep-penetrating tags



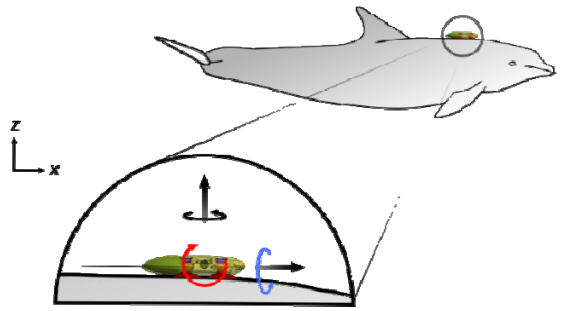
Hydrodynamic tag body design



Attachment design for a coupled system



Experimental evaluation of the tag system

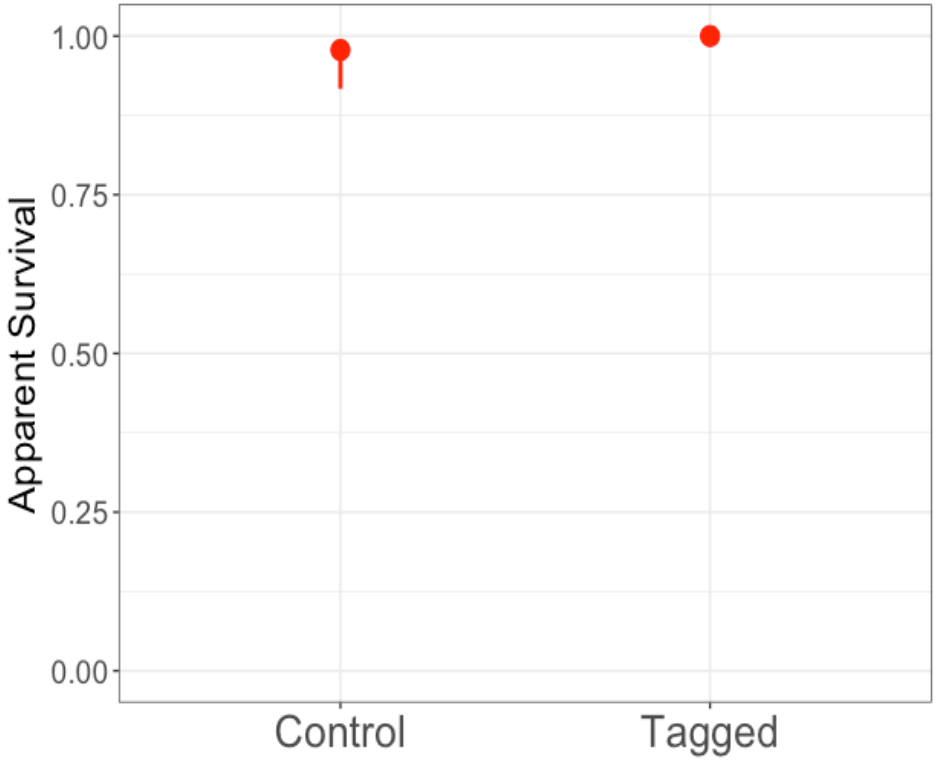


K.A. Shorter et al. 2017. Suction cup tags: design, testing and evaluation

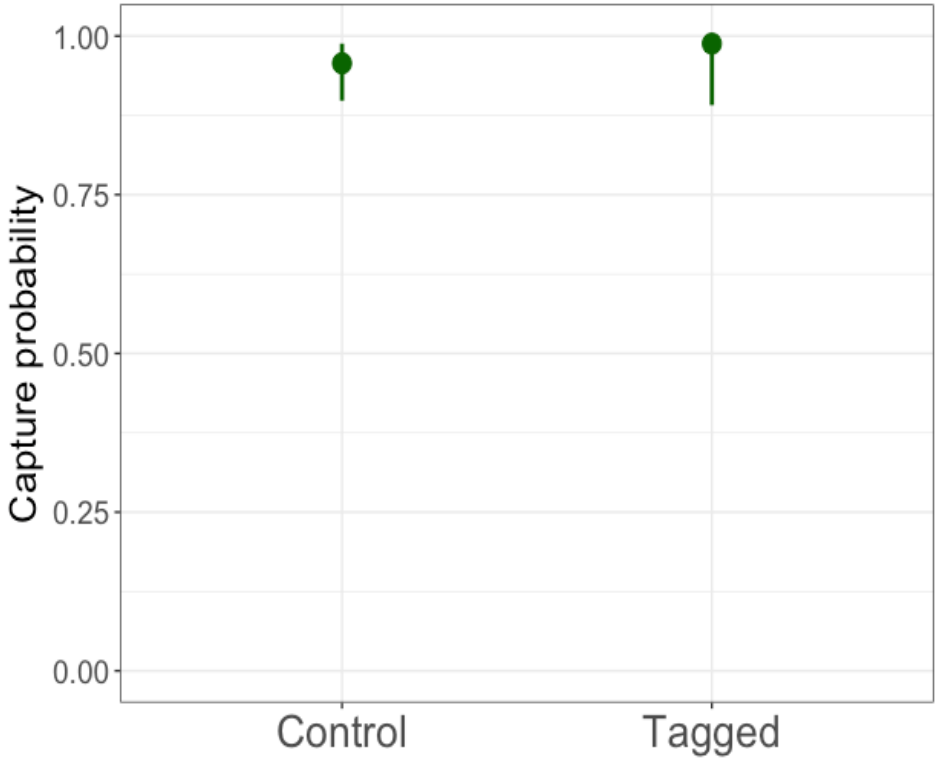
Increased follow-up to assess survival and reproduction of tagged individuals

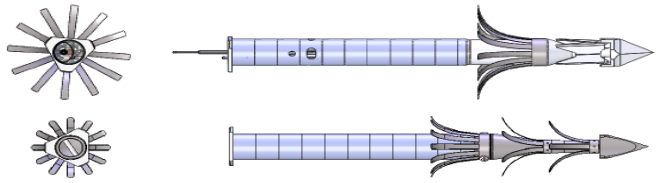
Female humpback whales in the Gulf of Maine

Survival



Capture Probability





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